

An EA Process Template for PMs

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Agenda

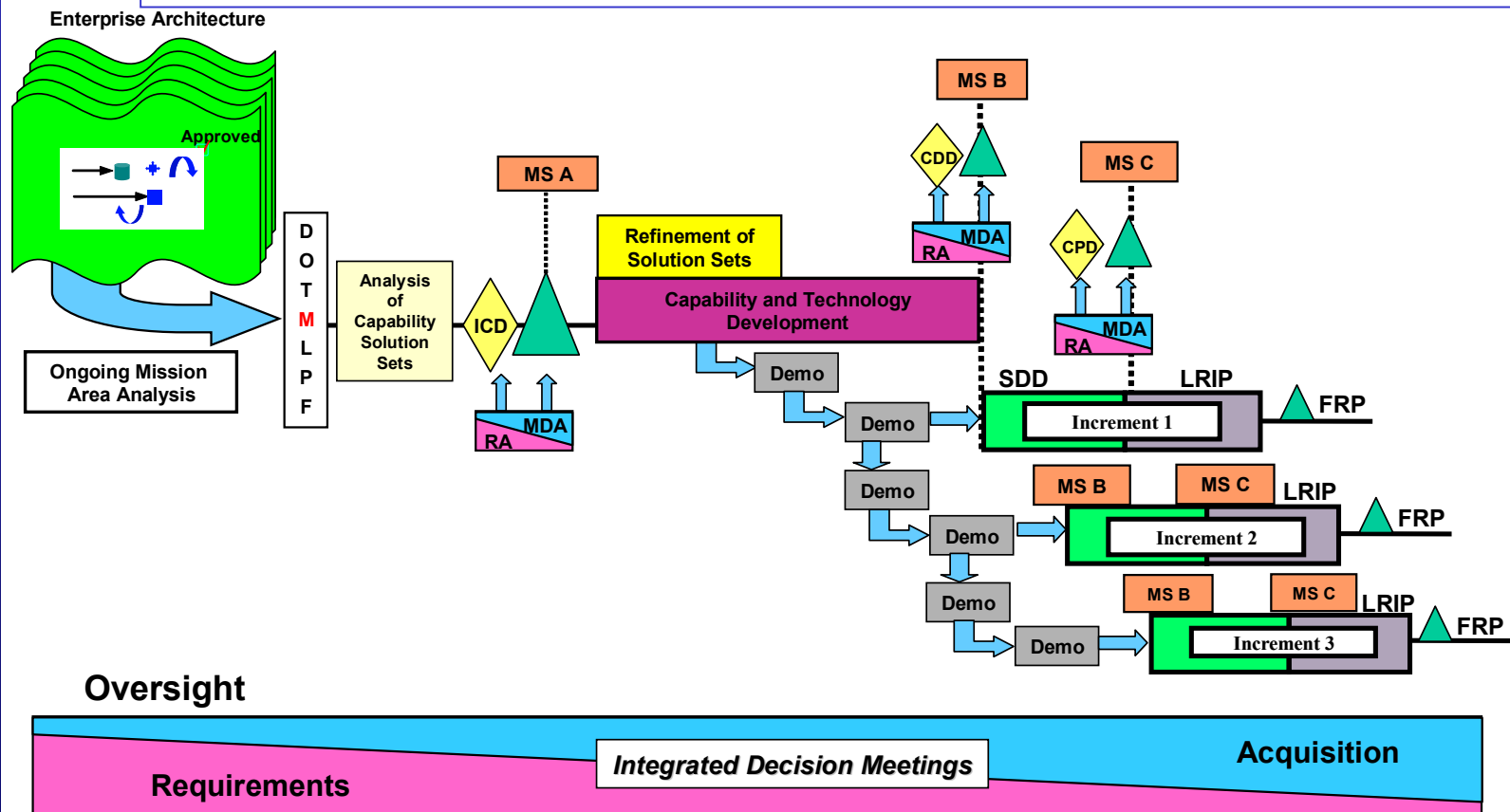
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- The “New” Acquisition Environment
- Definitions: Evolutionary Acquisition & Spiral Development
- Why an EA Process Template?
- Key Features of this Template
- Further Information and Help

The New Acquisition Environment

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Joint Capabilities Integration & Development System And Acquisition Process



Evolutionary Acquisition

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Evolutionary acquisition is DoD's preferred strategy for rapid acquisition of mature technology for the user. An evolutionary approach delivers capability in increments, recognizing, up front, the need for future capability improvements. The success of the strategy depends on the consistent and continuous definition of requirements and the maturation of technologies that lead to disciplined development and production of systems that provide increasing capability towards a materiel concept.

Source: **DRAFT** Attachment 2 to SECDEF memo,
Operation of the Acquisition System, dated 18 September 2002

Spiral Development

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A process in which a “...desired capability is identified, but the end-state requirements are not known at program initiation. Those requirements are refined through demonstration and risk management; there is continuous user feedback; and each increment provides the user the best possible capability. The requirements for future increments depend on feedback from users and technology maturation.”

Source: DRAFT Attachment 2 to SecDef Memo, Ops of the Defense Acquisition System, September 18, 2002

When to Apply EA

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- Requirements volatility
 - Changing requirements
 - Functional requirements
- Rapidly-evolving technology
- Rapidly-evolving threat
- Resource volatility

Why an EA Process Template?

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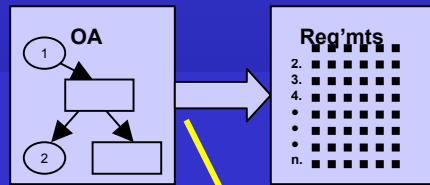
- Most EA literature and policy discusses EA in general terms
- PMs are left to figure out how to implement EA for their programs
- Not much “how to” or “why” information available
- This notional EA process template describes key features and functions that must exist, in some form, for EA to work
- This is not a cookbook “one size fits all” solution

Key Features of This EA Approach

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- Acquirer & User collaborate in requirements definition & domain analysis
 - Key artifacts: Operational and System Architectures, and time-phased requirements
- Early assessment of architectures
- Continuous management of cost and development risk
- Frequent feedback between acquirer and all stakeholders throughout development & support
 - Define, refine, and prioritize requirements based on OA, SA
- Four major concurrent processes:
 - Requirements Management
 - Risk Management
 - Production (including test & evaluation)
 - Delivery, Support & Feedback

Requirements Management Process



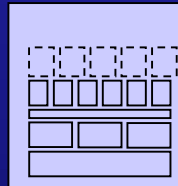
EA Process Overview (Single Iteration)

Risk Management Process



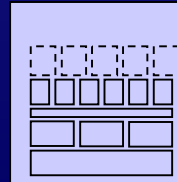
Production Process

System Architecture

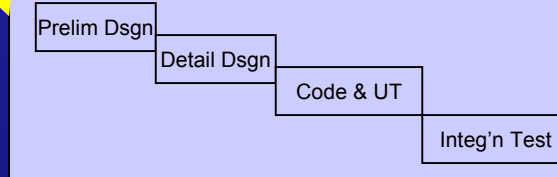


Delivery, Support & Feedback Process

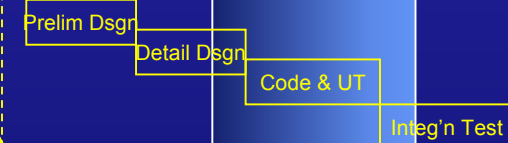
System Architecture



Increment "n"



Increment "n+1"



Feed-back

Plan

Train

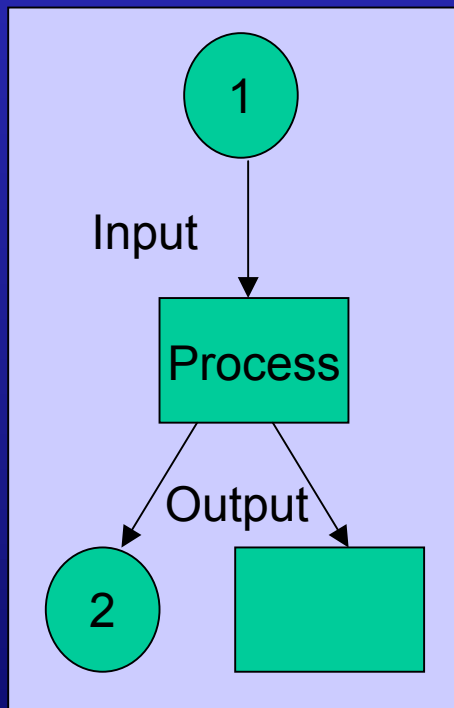
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Process: Requirements Management

Operational Architecture

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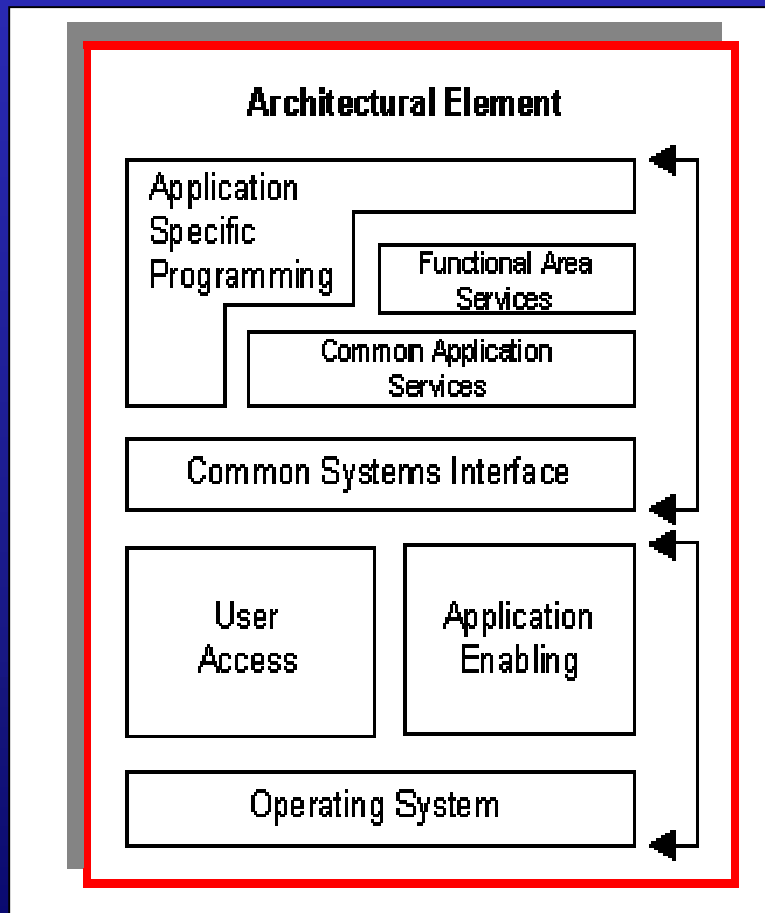
OA



- Represents how the User operates
 - Current and future doctrine, tactics, techniques, & procedures.
 - Time-phased: describes required capability growth over time
- Focused on User, facilitated by Acquisition, S&T Communities
- Coupled with domain modeling to allow first-order tradeoffs on capability vs. cost vs. time
 - Balances “What is Needed” with “What is Possible”
- OA must be validated by User, endorsed by acquirer
 - Both must “own” the OA and related System Architecture)

Develop a Systems Architecture

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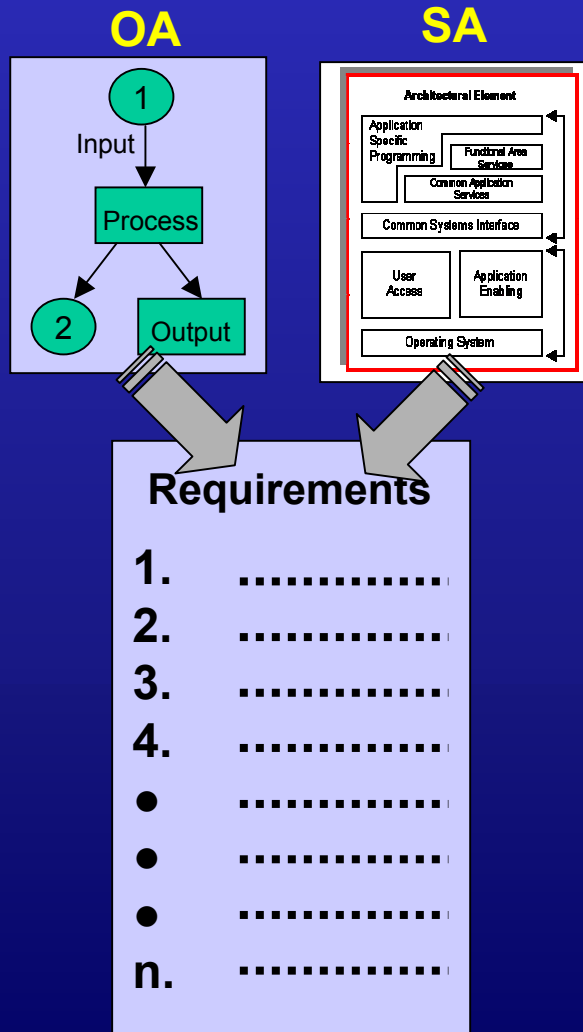


- SA describes functional “boundaries” of the program, interaction rules, and key interfaces
- Provides scalable framework within which functional capability will evolve
- SA reflects goals of flexibility, scalability, interoperability, robustness, security, etc.
- SA defined concurrently with OA
 - Output of domain analysis & modeling
- Analysis & design of SA informs the development of lifecycle cost model
- Establish or adopt an enterprise SA
 - Standard architectures exist for some domains
 - These enhance interoperability, facilitate reuse, and reduce risk

Graphic: Barry M. Horowitz, Ph.D. ESC-TR-94-208, September 1994

Derive the Requirements

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- Requirements describe capabilities required in the context of OA & SA
 - Must be prioritized in order of operational relevance & timing
 - Bounded by the constraints of the SA
- Dependencies may exist between requirements
- However: User Priority is the main driver for allocating requirements to increments

Process: Risk Management

Assess Cost & Risk

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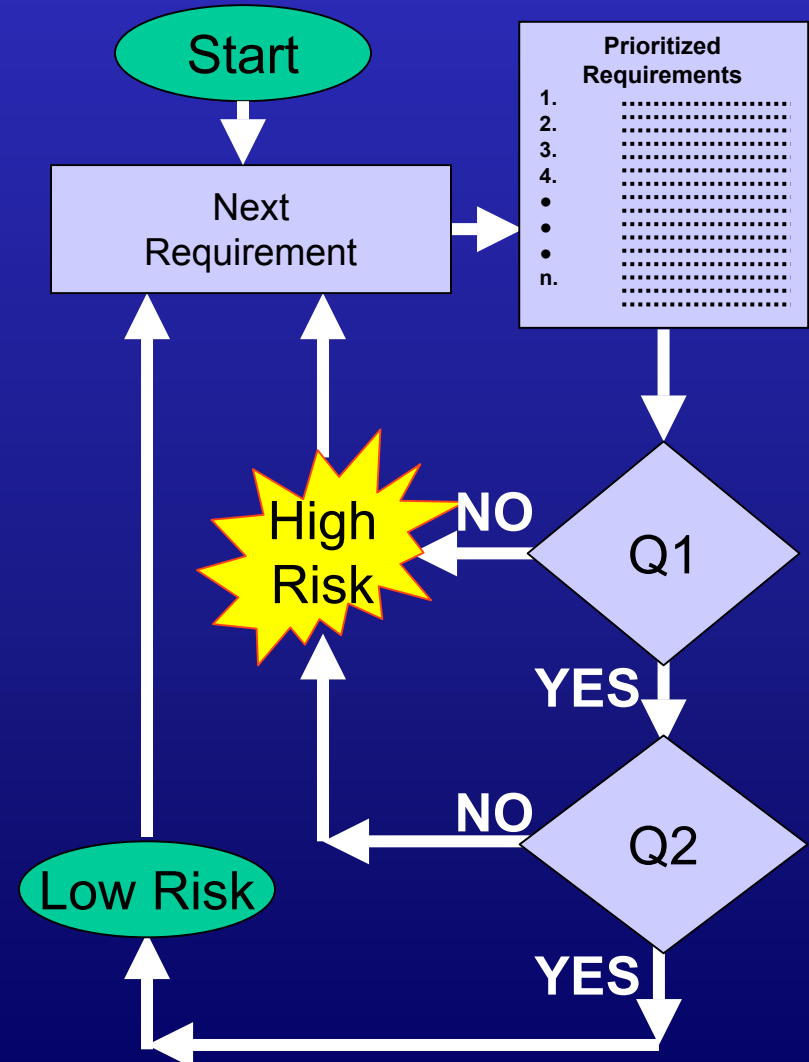


- Conduct cost and risk analysis
 - of each requirement
 - to reflect current understanding and technical maturity
 - to identify further dependencies
- Recognize schedule and budget constraints
 - Each requirement represents a “claim” on resources: budget & schedule
 - PM must ensure commitments don’t exceed resources for any given increment
- Provide input to budget & resource planning

Requirements Risk Assessment

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- For EACH REQUIREMENT
- You must answer 2 fundamental questions:
 1. Do I understand what is required?
 2. Does a solution exist?
- Answer “NO” or “I’m not sure” to Q1 or Q2 means HIGH RISK (until proven otherwise)
- High Risk requirements demand special attention before implementation (more on this later)



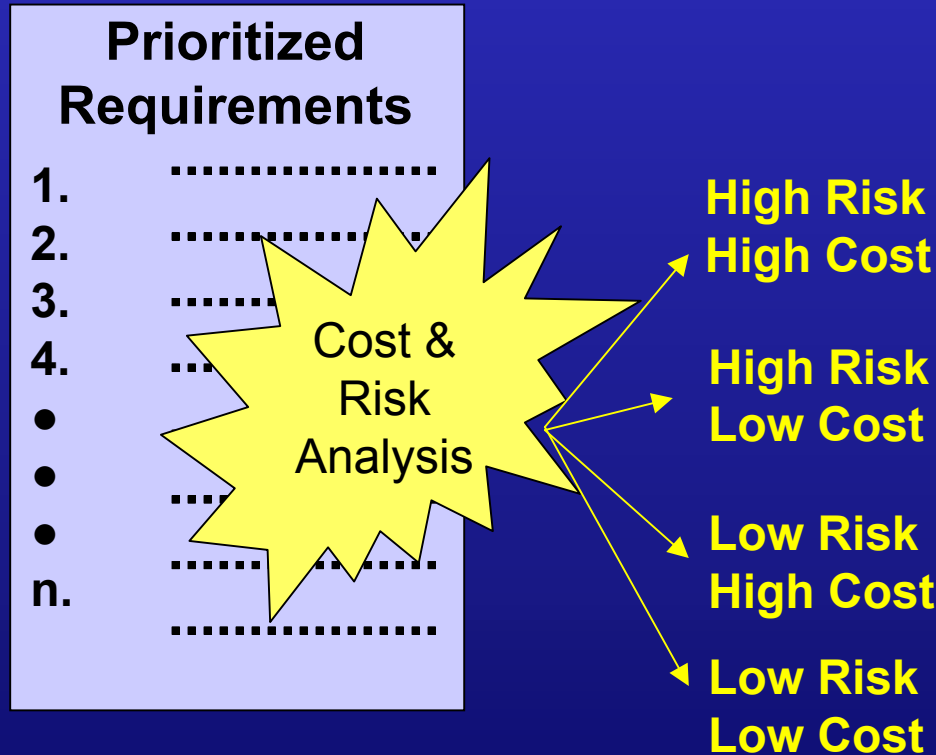
Requirements Cost & Risk

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- Apply standard cost estimating methodologies to requirements deemed “Low Risk”
- “High Risk” requirements require further scrutiny
 - What is the nature of the risk?
 - Poorly-articulated or understood requirement statement?
 - Current technology incapable of meeting specified performance?
 - What is the “magnitude” of the risk?
 - Do the Users know what they want?
 - How big is the technology gap?
- Risk mitigation scope and cost will depend upon this analysis
- Risk increases the expected cost and variance for any requirement

Assess Cost & Risk (continued)

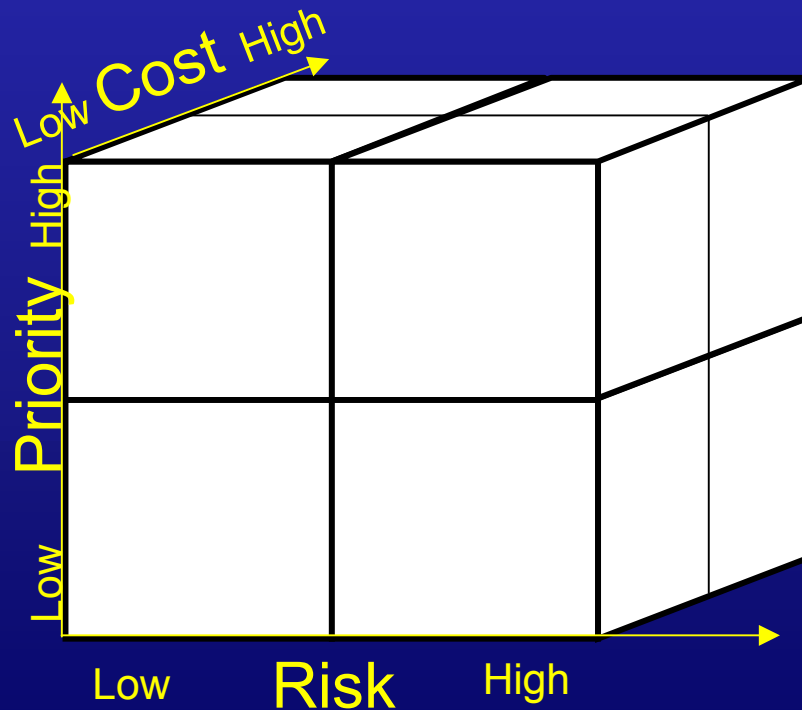
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- Users, through OA, establish the priority for each requirement
- PMO analysts establish initial risk and cost attributes for each requirement
- These priority cost and risk assessments are preliminary, and are used for planning
- Continuous, proactive risk/cost management ensures affordability of build plan

Assess Cost & Risk (continued)

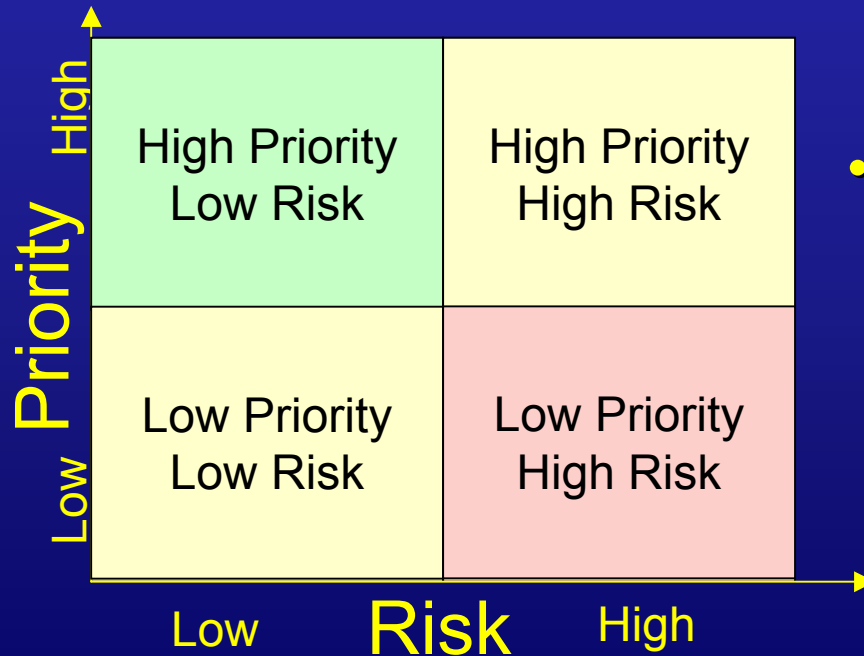
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- Each requirement will have attributes of priority, cost, and risk
- Attributes can be expressed in a matrix
- Note that risk and cost are generally correlated

Assess Cost & Risk (continued)

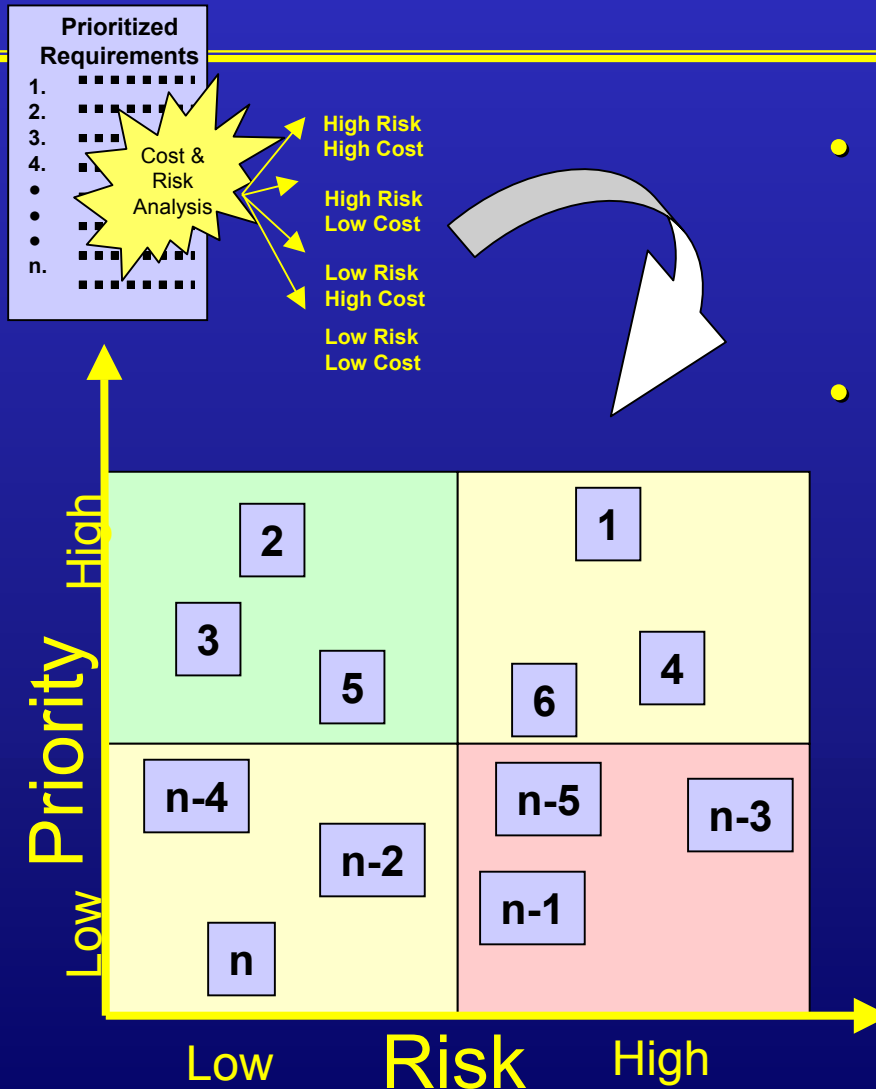
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- Since cost and risk tend to be correlated, the 3D matrix can be simplified into a 2D priority vs. risk matrix
- Risk/Priority matrix provides a guide to
 - implementation sequence
 - risk management strategies
 - resource allocation priorities

Assess Cost & Risk (concluded)

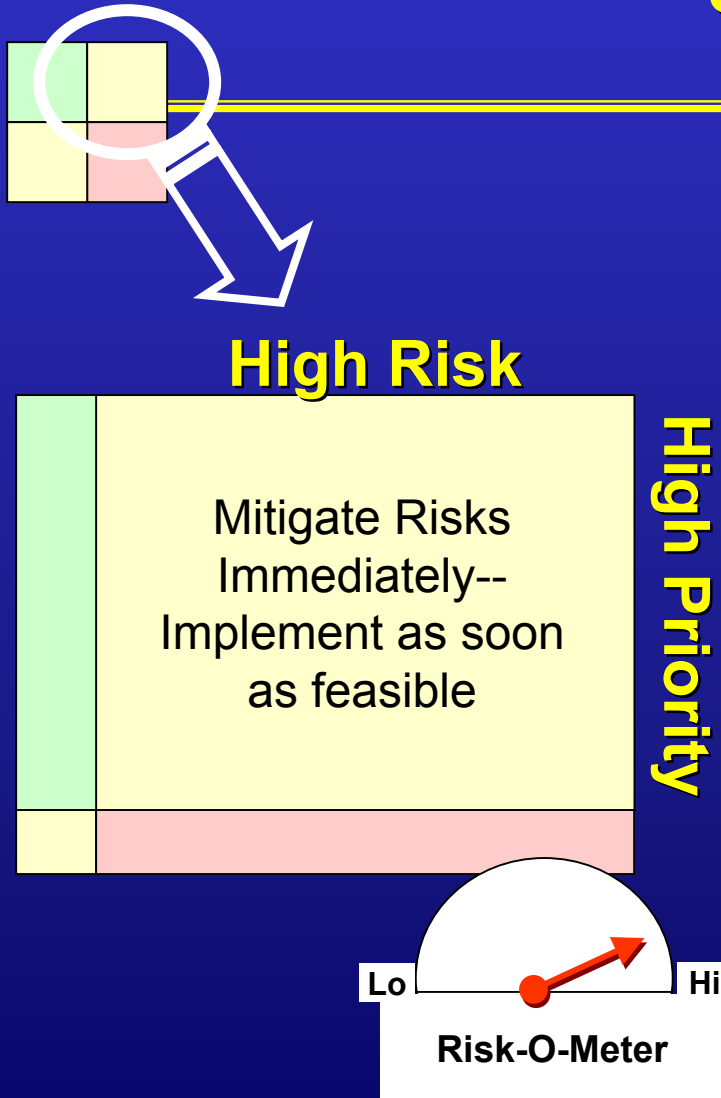
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- Each requirement is mapped to the risk/priority matrix
- Use this framework to
 - Allocate requirements to increments
 - Develop risk management strategies
 - Facilitate resource planning
 - Conduct tradeoffs with Users & other stakeholders

Mitigate Risks

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- For **High-Priority/High-Risk** requirements

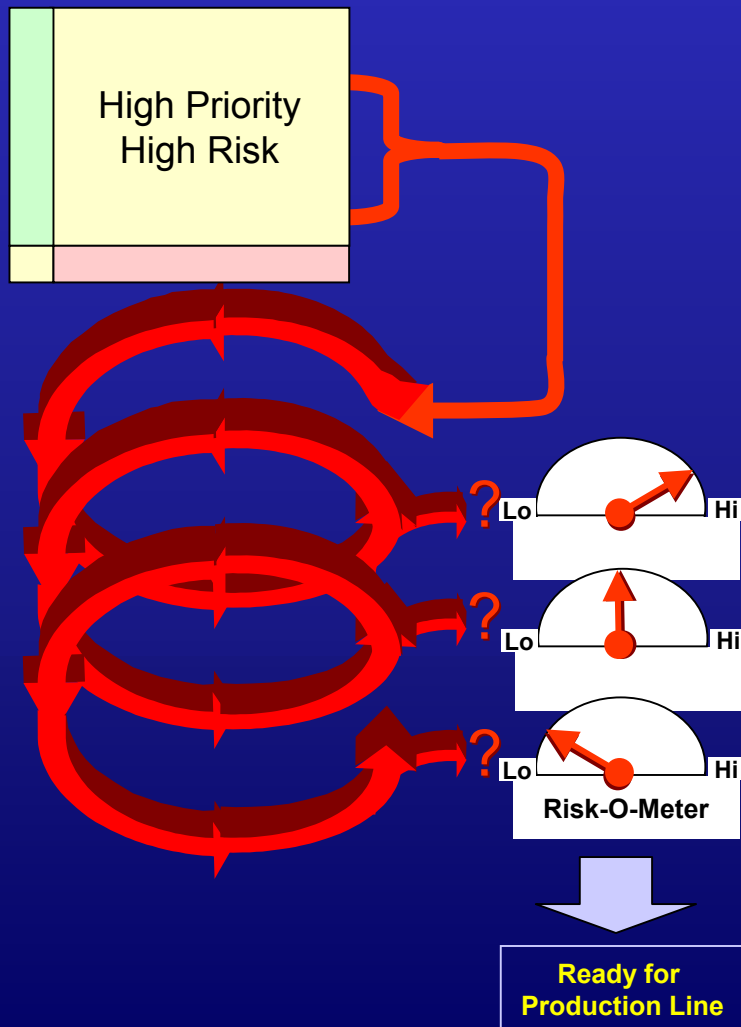
- Develop mitigation strategy based upon nature, magnitude of risk (reference previous cost/risk analyses)
- Do not defer simply because risk is high;

-BUT-

- Do not implement until risk is reduced

Mitigate Risks (continued)

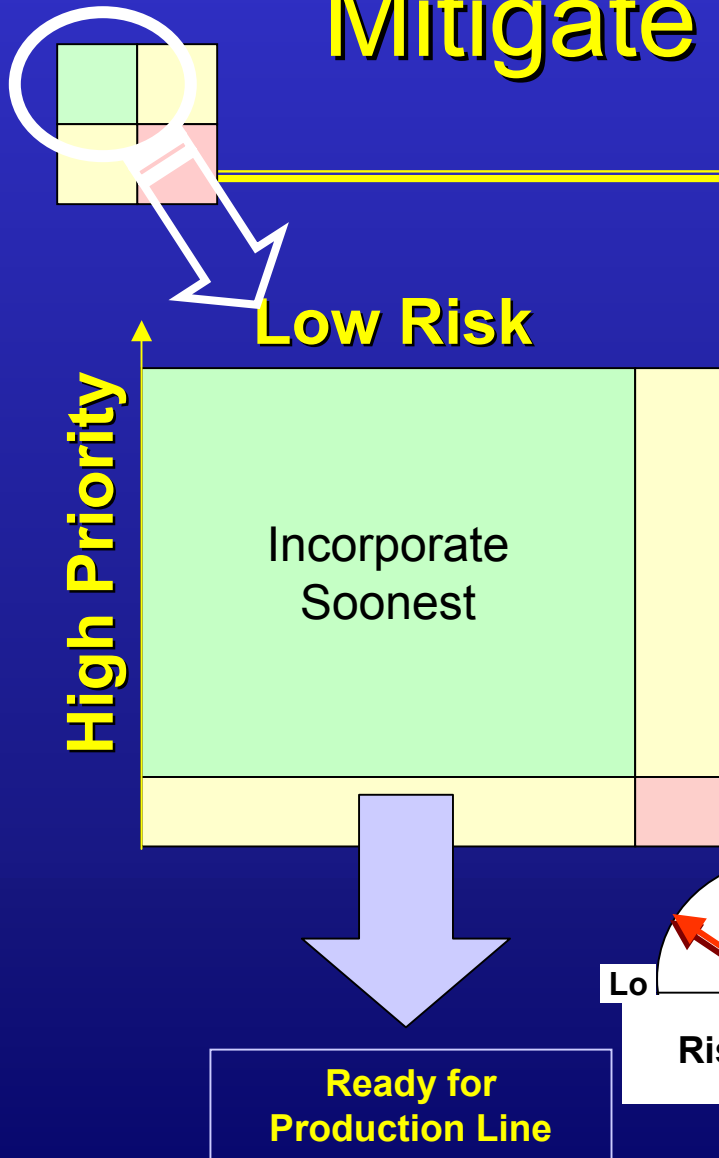
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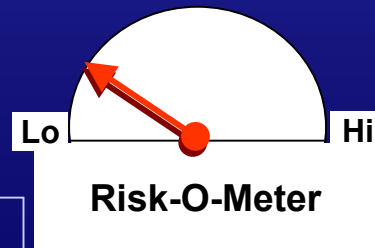
- Risk mitigation approach depends upon nature of risk
- Common sources of Risk
 - poorly-specified requirements
 - technical immaturity
- Spiral Development a useful tool
 - Rapid prototyping with User to resolve requirements ambiguities
 - Iterative prototypes to resolve technical maturity issues
- Keep prototyping activities focused
 - Establish limits on cost and duration
 - Tailor output to feed production line
- Exit Criterion: Low Risk

Mitigate Risks (continued)

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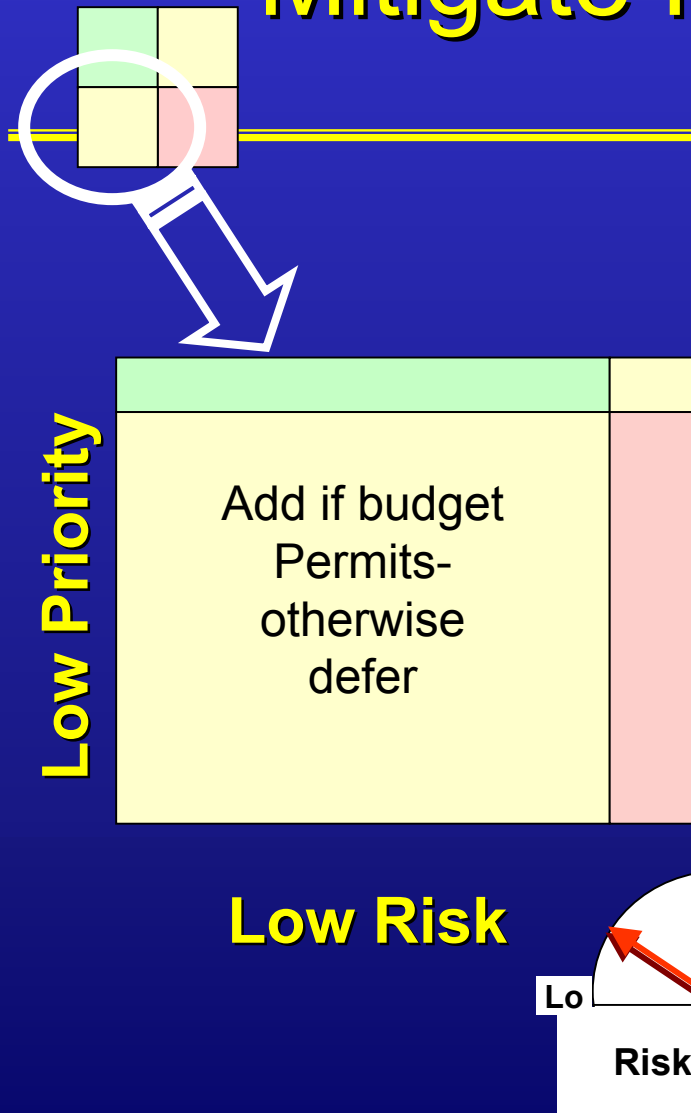


- For **High-Priority/Low-Risk** requirements
 - Allocate to increment based on
 - Priority
 - Resource and other constraints
 - Dependencies with other requirements
 - Don't devote entire budget to Low Risk requirements
 - High Risk "Gotchas" are out there waiting to bite you!



Mitigate Risks (continued)

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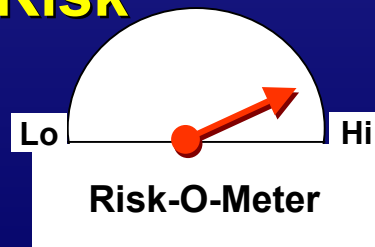
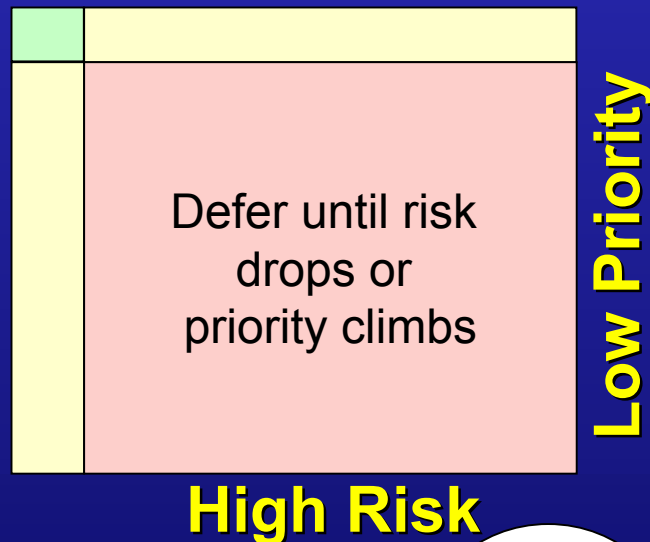
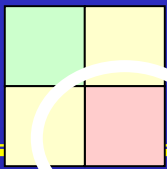


- Don't commit to production simply based upon low risk
- User Priority should drive production sequence
- Low priority-low risk requirements should be added only after higher priority requirements have been attended to

Mitigate Risks (continued)

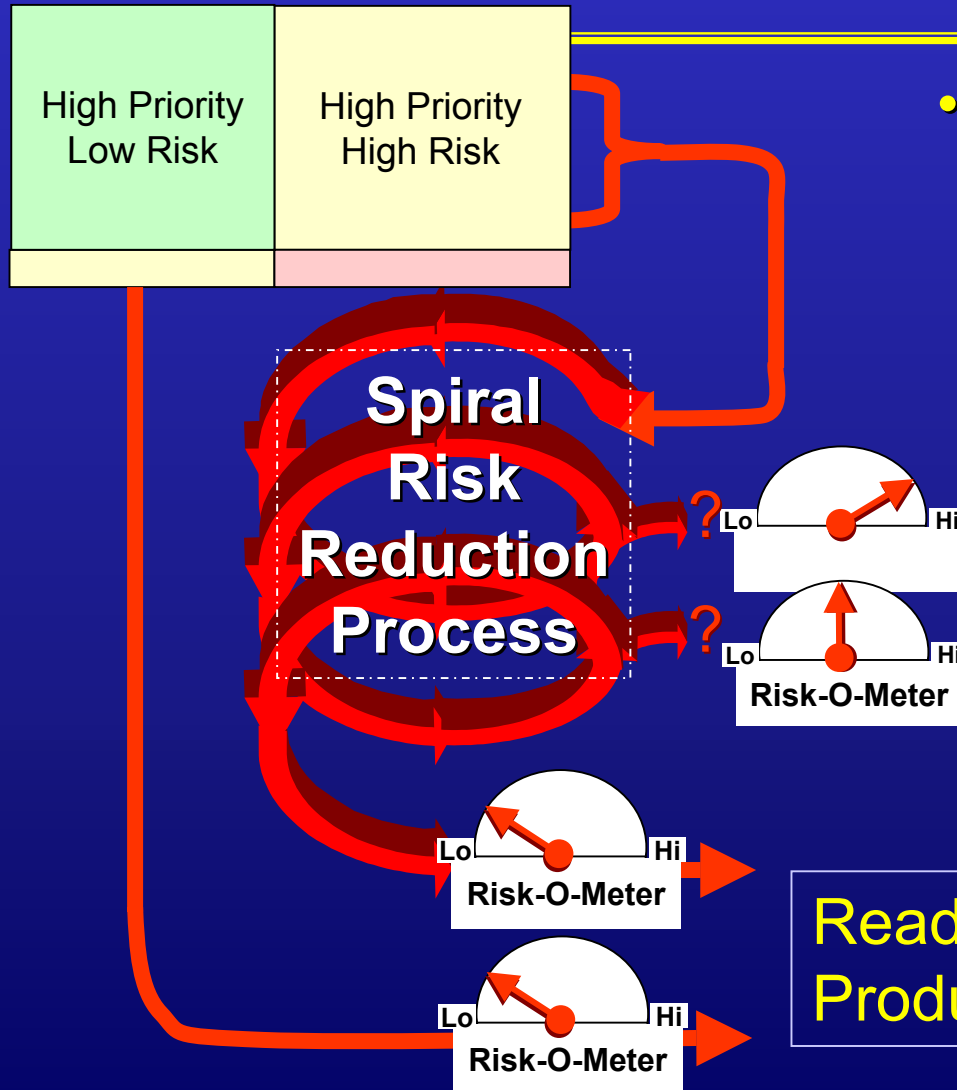
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- Low Priority/High Risk requirements should be deferred, but not discarded
- Priorities and risks are relative, and will change over the implementation period
 - As top priorities are satisfied, the lower priorities will rise
 - As technology progresses, risky requirements will become feasible
 - As new threats emerge, low priority enhancements may become essential
 - As doctrine and policy evolve, so will the OA, giving rise to new, or re-prioritized requirements



Mitigate Risks (concluded)

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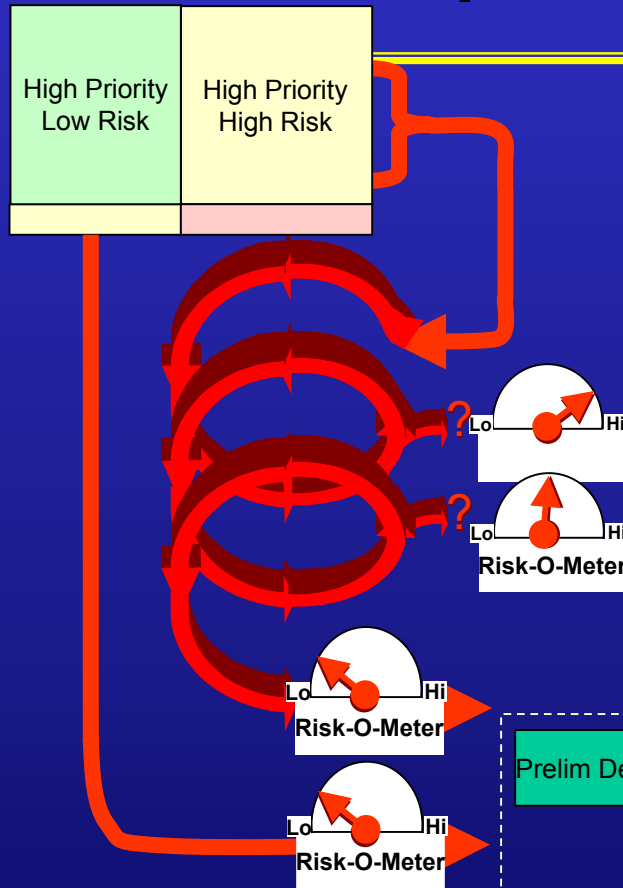
- Transfer only low-risk high-priority tasks to the production line
 - Addresses Users' most pressing needs
 - Allows efficient production processes to be used
 - Enables predictable increment deliveries (important to Users)

Ready for
Production Line

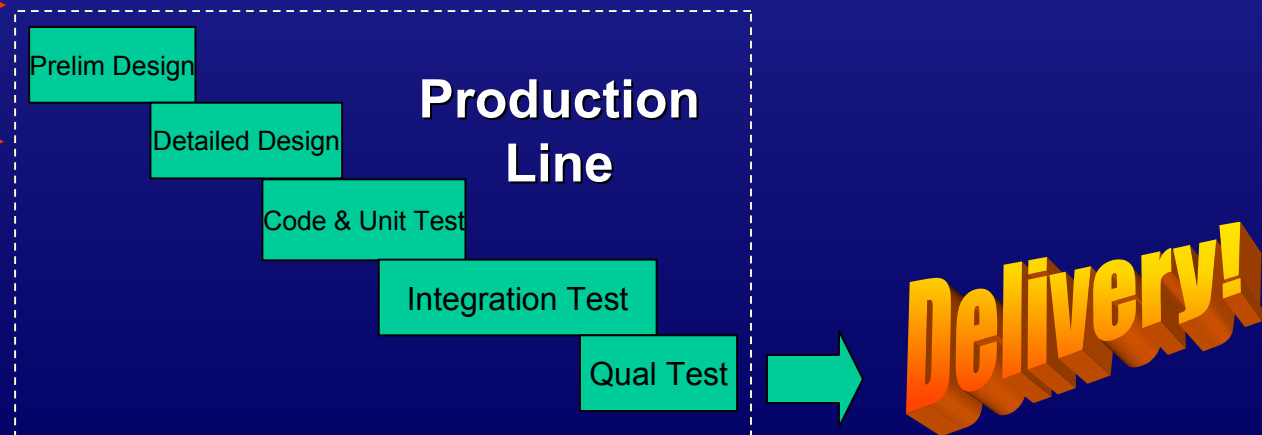
Process: Production

Concept: The Production Line

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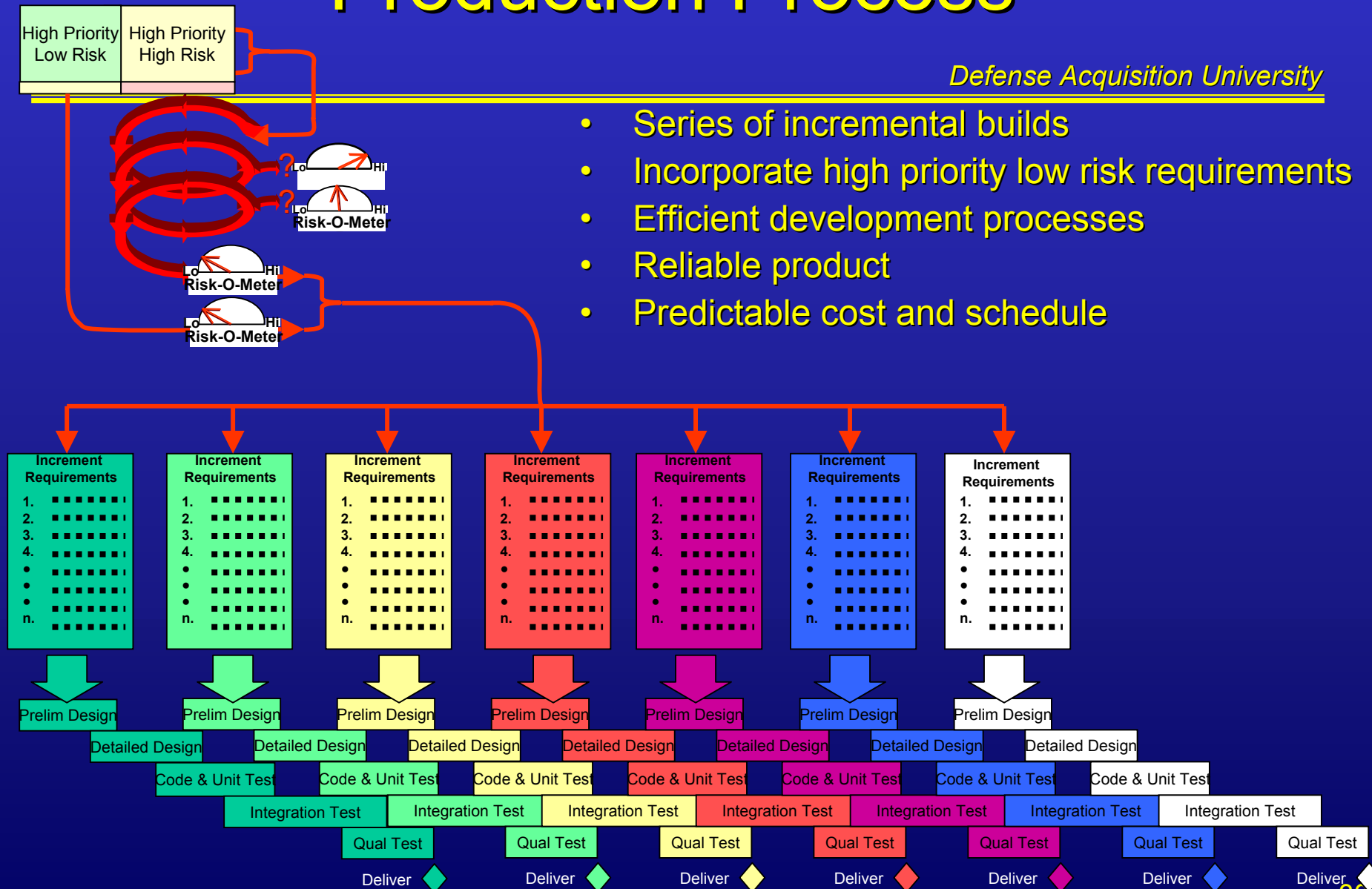
- If risks have been mitigated, highly efficient production processes can be used
 - Tasks have limited, well-defined scope
 - Requirements are stable, low risk to implement
 - Enables application of CM, EVM and other measurement-based management tools
 - Facilitates process maturity, workforce stability
- Focus is Schedule and Cost predictability



Production Process

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- Series of incremental builds
- Incorporate high priority low risk requirements
- Efficient development processes
- Reliable product
- Predictable cost and schedule



Process: Delivery, Support & Feedback

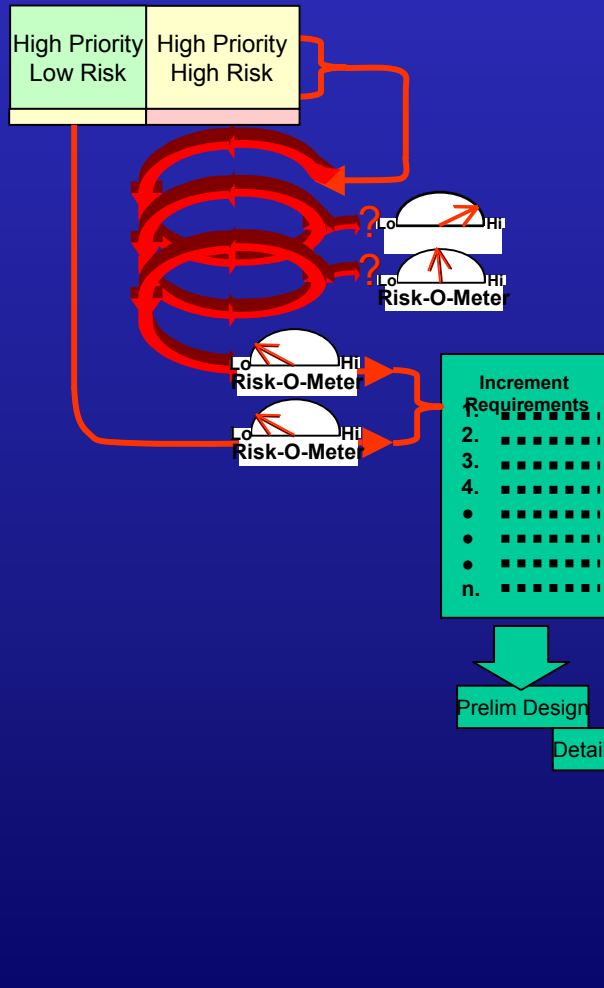
Key Concepts

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- Deliver on-time with promised capability
 - Maintain credibility of acquisition process
- Support what is delivered
- Establish integrated corrective action & requirements management process
 - Distinction between “development” and “support” is not as meaningful in EA
 - Establish regular feedback, requirements development, validation, prioritization meetings
 - Leverage training, testing, experimentation opportunities to gather “ground truth” data

Delivery, Support & Feedback

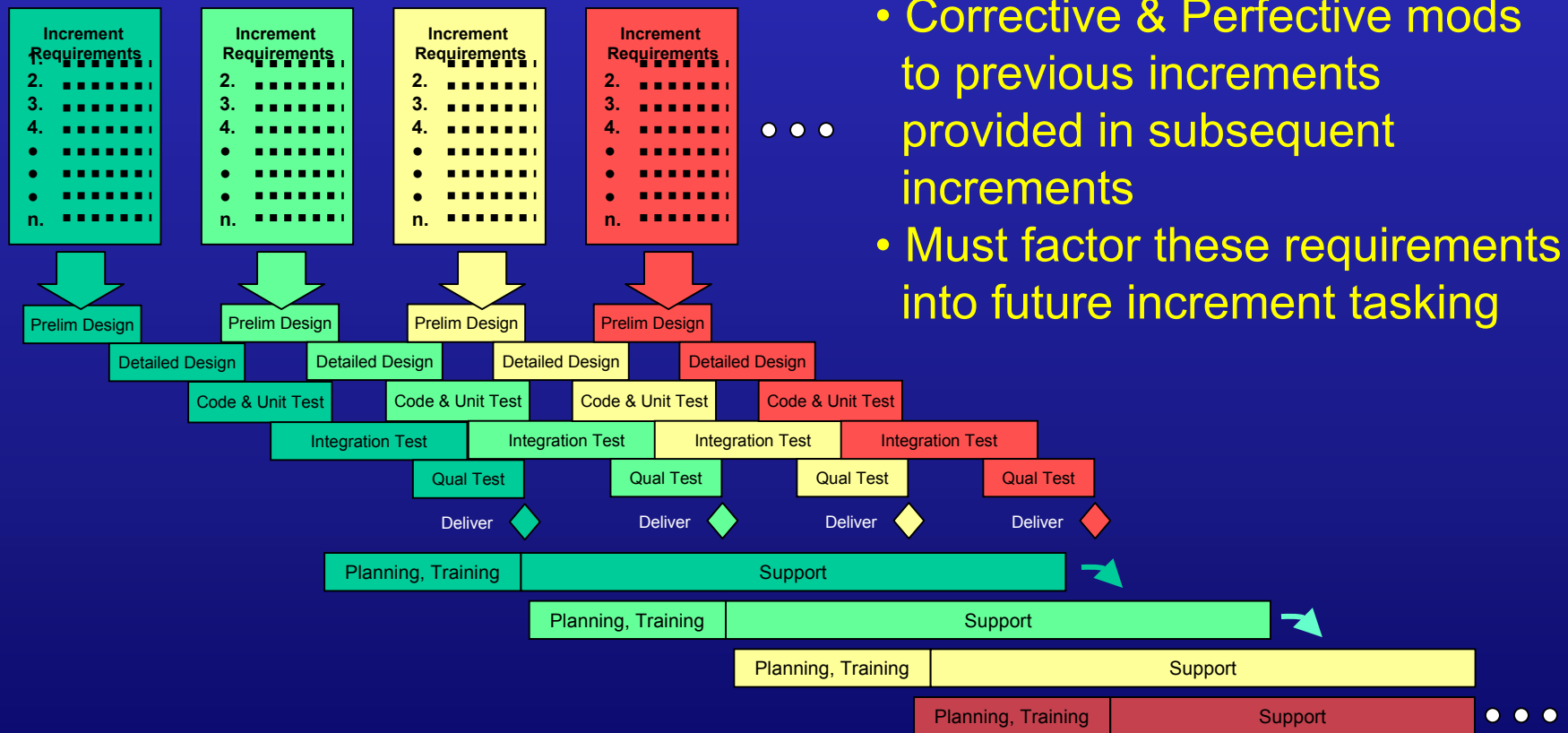
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- Types of Feedback to Expect
 - Corrective (“fix what’s broken”)
 - Perfective (“the system would be better if..”)
 - Adaptive (reflects changes to OA)
- All impact requirements
 - Addition of new requirements
 - Clarification of existing requirements
 - Re-prioritization of all requirements
- System requirements management process must be sufficiently robust to accommodate all feedback types—automation is a must!

Supporting Increments

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Summary

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- Acquirer must collaborate with user in requirements definition
- Acquirer must stay engaged with user throughout product lifecycle
- Establish and distribute SA as first “deliverable”
- Implement functionality in order of operational priority using OA as reference
- Mitigate risk of high-priority requirements using spiral development
- Send only low-risk high-priority requirements to production line
- Integrate test and support early and throughout increment development
- Institute formal support & feedback over lifecycle

Further Information & Help

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- Visit the Program Management and Systems Engineering Communities of Practice
- Available via the DAU Website:
<http://www.dau.mil>